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TP+W)
file.
PIGMI II

[redacted]

September 25, 1961

[redacted]

STATINTL Reference: [redacted] Task Order 1

STATINTL [redacted]

On September 12, 1961, we received your verbal communication to stop further work under the referenced contract. We would like to review briefly the sequence of events leading up to that time and the work which has been accomplished to date.

In July of this year, system test of the LARR and PIGMI II was started. It was immediately determined that a compatibility problem existed between the LARR and PIGMI and between the PIGMI and its readout equipment. Some of the readily
ILLEGIB apparent problems were random changes in the counter position, unreliable operation of the present function, line transients caused by other equipment interacting with the system and random sign reversals. Some of the less apparent problems occurred in incorrect buffer transfers from the counters on a "COPY" command and random changes of buffer store before and during readout.

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Most of these major problem areas were well defined within this first four weeks of systems test. Work on correcting these errors was started in August. However, due to masked or hidden problems which were not readily apparent dur-
ILLEGIB ing our first evaluation, progress was slow although positive. Some of the corrective actions taken were as follows:

1. Shielding of all cabling within the LARR. This consisted of shielding of digitizer lamp leads; separation of signal and power grounds and the reshielding of signal lines in associated twisted pairs.

2. Redesign of counter circuitry to reduce sensitivity. This consisted principally of the addition of plus bias voltage to logic gates.

3. Redesign of PRESET circuitry in PIGMI. Redesign of logic circuitry to isolate circuitry from counter and addition of bias to redesigned gating system.

4. Redesign of sign circuitry to reduce sensitivity. This was accomplished by changes in circuitry and also the addition of bias to gating circuitry.

Since progress had not been commensurate with the time spent, near the end of August an engineering-management meeting was held to re-evaluate the problem and to determine the most direct approach to a positive solution. It was

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decided that two major steps needed to be taken before any additional work in minor areas was to be accomplished. These consisted of the following:

1. Adding the required bias voltage to the counter flip-flops.

2. Removal of the pre-amplifiers from the PIGMI unit and placing them directly with their associated digitizers within LARR.

The first corrective measure was required for proper operation of the flip-flops and to prevent noise transients from appearing at the base of the transistors. Once accomplished, the counters were stabilized.

The second action, that of rebuilding the pre-amplifiers directly adjacent to the optisyn units eliminated the noise pickup due to the long high impedance leads from the LARR to PIGMI.

Another review was made on 11 September 1961 at the completion of this work. Due to the major improvements made, it was decided to complete these modifications for one complete counter. This decision was made just prior to your stop action.

Since that time (September 12, 1961), we have completed this work on our own initiative. The results of these tests have been satisfactory. The counter at this time accumulates and buffer transfers accurately. The preset and sign change have been corrected. The noise problem has been reduced to less than five per cent of the original level. The one remaining problem area exists between the counter and readout drawer, more specifically between the stepping switches and counter which can now be tested statically. No changes or modifications have been made to the readout drawer to arc suppress relay or step switch coils, or to the LARR to arc suppress the switches of clutch coils. Proper arc suppression of these components should eliminate the few random counter changes now occurring. In operation with our standard product line, the back inductive voltage generated by these coils located in our standard readout drawer is not sufficient to cause adverse effects on other sections of that equipment. This equipment generally can be described as operating from low impedance sources with large signals, whereas the transistorized version of the PIGMI has high impedance sources with small signals. Therefore, even small induced voltages from these coils appear as signal levels (from 3 to 10 volts) and are processed in the logic circuitry in the same manner as signals from the digitizers. In the case of our vacuum tube version of the PIGMI, the signal levels are considerably larger than the induced voltages, of the order of 50 volts, thus not presenting the present compatibility problem.

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[redacted] USN, visited our facilities on 21 September 1961 to determine the status of the equipment. We reviewed with him the work which has been done over the past three months and demonstrated the equipment. For your convenience, we have attempted to summarize his findings:

1. The main problem has been one of electromagnetic pickup.

2. The remaining problem appears to be localized in the readout drawer and, more specifically, to the stepping switches within that drawer.

3. There exists at least a 90% probability of success if the following actions are taken:

   a. Arc suppress all relays and stepping switches within the readout drawer.

   b. Arc suppress, where possible, clutches, relays and switches within the LARR unit.

   c. Make necessary modification on the second counter as has been accomplished in the first unit.

   d. Reroute and change as necessary cabling within the LARR.

   e. Rebuild the pre-amplifier on the second optisyn unit.

   f. Provide additional shields as necessary on interconnecting cables.

   g. Recommend the use of line filters or shielded enclosures as required for proper operation of the system at your facility.

Based on the above factors, as well as the discussions on September 21 with
STATINTL both you and [redacted] we are recommending the following courses of action:

Alternative No. 1. That we proceed as quickly as possible with the completion of the PIGMI II called for by the existing contract. As indicated, the probability of success for this course of action is at least 90%. As regards the time schedule, the modifications could be completed in approximately two weeks with final systems tests requiring an additional two to three weeks. Accordingly, assuming the present schedules and technical assumptions hold, shipment of the completed system could be made by or before the end of October. For your reference, we are summarizing in the attached schedule the status of costs at the several most recent check points as well as the current estimate of costs required to complete.

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Alternative No. 2. Stop all further work on the PIGMI II and proceed with the necessary modifications to the LARR so as to make it compatible with the PIGMI unit presently installed at your facility. These modifications will require essentially mounting of two rotoverters in place of the present optisyn unit as well as providing the necessary interconnecting cables and mechanical hardware required to attach the rotoverters. The costs required to accomplish these modifications to the LARR are approximately [redacted] including installation of the equipment at your facility. It should be noted that choice of Alternate No. 2 will degrade the currently designed operating speed of the LARR by about 40% because of the fact that the vacuum tube version of the PIGMI which you currently have has an inherent counting rate limitation and, also, due to the fact that it requires a greater amount of time to transfer data to the buffer, thus precluding readout "on the fly". STATINTL

As indicated earlier in this letter, we are at present continuing with work on the PIGMI II on our own cognizance. In the event you wish to select Alternative No. 1, the estimates indicated above assume no discontinuity in the work and, hence, a prompt indication from you as to your wishing to proceed. I shall be in Washington, D.C. during the latter part of this week and will plan to call you on this matter at that time.

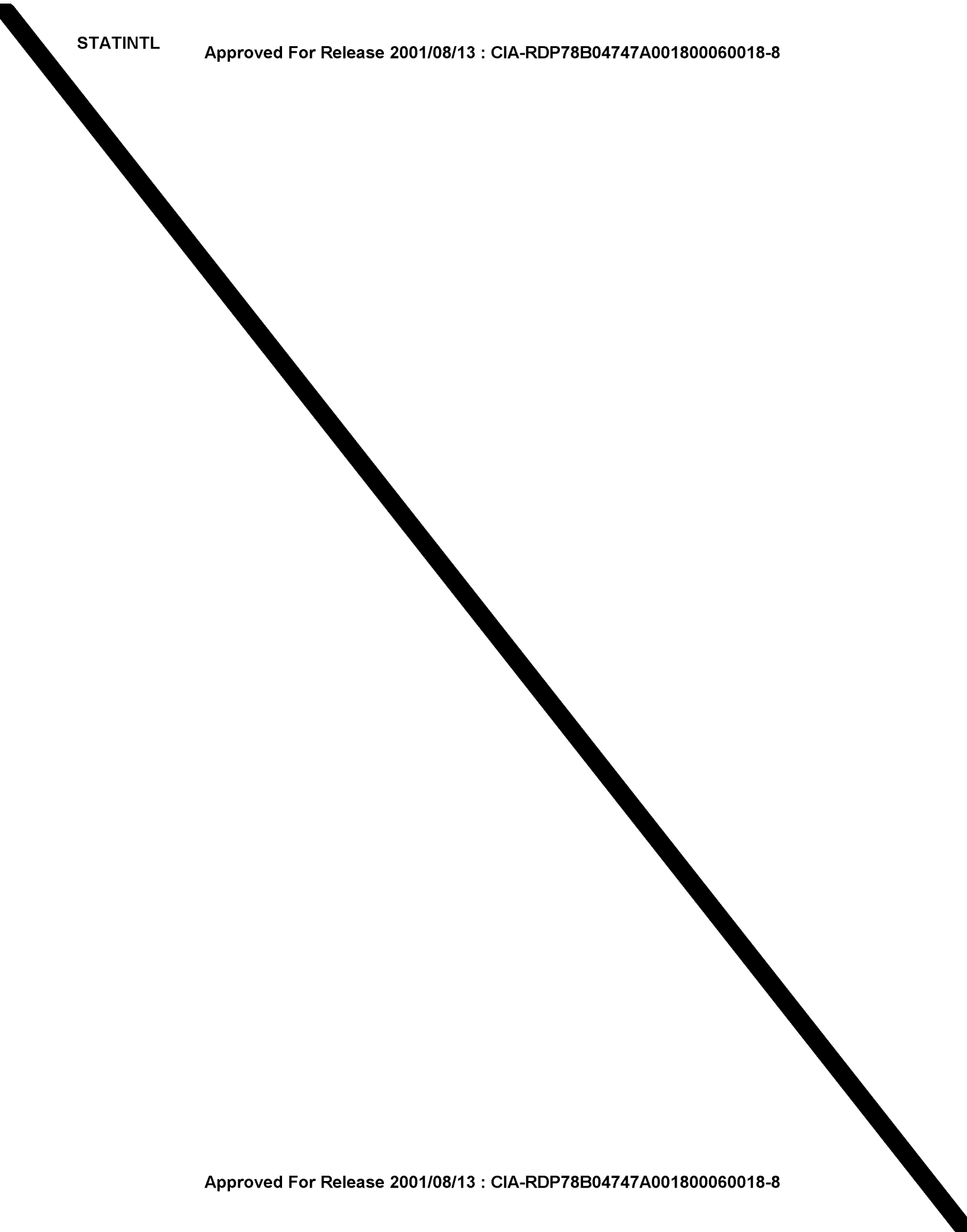
STATINTL

Sincerely yours,

[redacted]
Executive Vice President

HJR:pg

Attachment



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